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ABSTRACT

A description is given of three studies on the effects of teacher clarity upon student achievement. Three low inference variables of teacher clarity--vagueness terms, mazes, and additional unexplained content--were selected for study. Vagueness terms are words or phrases indicating approximation, unclarity, or lack of assurance. A maze is defined as any unit of discourse that does not make semantic sense such as false starts or halts in speech, redundancy, and tangles of words. Clarity is exemplified by simplicity of expression. Eight lessons, scripted to be conducted by one teacher, each containing examples of lack of clarity, were observed. The results of these studies indicated a cause-effect relationship between teacher lack of clarity and student achievement. The effects in absolute terms, however, were small. (JD)

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Low Inference Teacher Clarity Variables

Effects on Student Achievement

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Most research on the effects of teacher behaviors on student learning has been correlational in design. The findings of such research may suggest that the presence or absence of a particular teaching behavior causes students to learn more but other interpretations are possible. An experimental design is necessary to establish cause-and-effect between an independent variable and a dependent variable. Another problem of previous research is that high inference measures of teacher behavior have been used rather than low inference measures. The specific, observable teacher behaviors (i.e., low inference measures) that underlie high inference measures are often unclear. Therefore, the results of studies using high inference measures are difficult to interpret and to replicate.

The purpose of this paper is to respond to the call for greater specification of teacher behavior variables and the use of experimental designs to study their effects on student achievement. In particular, the present article describes three studies of the effects of teacher clarity (using low inference definitions) on student achievement.

Teacher clarity is a potentially powerful variable as documented by the correlational studies reported by Rosenshine and Furst (1971) and Good and Grouws (1977). Rosenshine (1971) and Bush, Kennedy, and Cruickshank (1977) have stressed the need for experimental, low inference studies of the effects of teacher clarity on student achievement.

Low inference indicators of teacher clarity have been identified in the correlational research of Bush et al. (1977), Hiller, Fisher, and Kaess (1969) and Smith (1977). Dunkin and Biddle (1974) identified vagueness terms as a low inference variable deserving of additional research. Vagueness terms are words or phrases indicating approximation, unclarity, or lack of assurance. Hiller et al. (1969) formulated nine categories of vagueness to classify over 200 different terms. Hiller et al. (1969) and Smith (1977) reported significant

negative correlations, ranging from -.41 to -.59, between the occurrence of teacher vagueness terms and student achievement.

Smith (1977) reported nonsignificant negative correlations (-.23 and -.28) between the average number of teacher mazes per minute and student achievement. Hunt (1968) defined a maze as any unit of discourse that does not make semantic sense. Smith (1977) classified the following teacher behaviors as mazes: false starts or halts in speech, redundantly spoken words, and tangles of words.

The number and context of terms in a lesson apparently has not been explored extensively as an indicator of teacher clarity. Kennedy, Cruickshank, Bush, and Myers (1978) identified what may be a comparable behavior in their variable, "explains things simply." Linville (1970) studied difficulty of syntax and vocabulary in mathematics with fourth grade students. An analysis of variance performed on the data revealed significant main effects in favor of easy syntax and easy vocabulary.

Based on this review of previous research, three low inference variables of teacher clarity--vagueness terms, mazes, and additional unexplained content (which increased the number and context of terms)--were selected for study.

Study 1

Smith and Edmonds (1978) found significant differences in achievement, F (2,198) = 3.66, $p < .05$, between students learning under vagueness conditions and students learning under no vagueness conditions. They studied the effects of high, moderate, and no teacher vagueness terms on achievement. Videotaped lessons that focused on mathematics concepts and generalizations were used. A posttest on the concepts and generalizations presented in the lessons was written at the knowledge, comprehension, and application levels. The vagueness

main effect was significant; follow-up tests showed a significant difference ($p < .05$) between the high vagueness and no vagueness groups, with the no vagueness groups scoring higher.

Study 2

In a partial replication of the Smith and Edmonds study, Land and Smith (1979) studied the effect of teacher vagueness terms on student achievement in mathematics by using two levels of teacher vagueness: high vagueness lessons versus no vagueness lessons. The dependent variable consisted of student achievement as measured by a posttest. There was a significant difference, t (48) = 2.28, $p < .05$, in favor of the no vagueness treatment group.

Study 3

Method-Study 3

The authors used a 2 (teacher vagueness versus no teacher vagueness) x 2 (teacher mazes versus no teacher mazes) x 2 (additional unexplained content versus no additional unexplained content) experimental design to study the joint effects of low inference clarity indicators. The vagueness lessons contained 7.5 vagueness terms per minute; the maze lessons contained 5.1 mazes per minute; the lessons with additional unexplained content contained references to 0.75 additional terms per minute. In order to achieve maximum control over teacher variables, the lessons in the study were scripted and then videotaped by one teacher. The lessons were concerned with mathematics concepts and generalizations. The only difference in the videotaped lessons was the presence or absence of the low inference behaviors being studied. The teacher did not appear on tapes; only his voice and overhead transparency projections were taped. The basic material was covered in the same order in each videotape. An example from each of the eight lessons follows:

No Vagueness Terms, No Extra Content, No Mazes:

This mathematics lesson will enable you to understand number patterns. Before we get to the main idea of the lesson, you need to review four prerequisite concepts. The first concept you need to review is positive integers. A positive integer is any whole number greater than zero.

No Vagueness Terms, Extra Content, No Mazes:

This mathematics lesson will enable you to understand number patterns and about sequences and numerical progression. Before we get to the main idea of the lesson, you need to review four prerequisite concepts. The first concept you need to review is positive integers which are not to be confused with integral equations. A positive integer is any whole number greater than zero.

No Vagueness Terms, No Extra Content, (Mazes):

This mathematics lesson (will enab...,) will get you to understand (number, uh,) number patterns. Before we get to the (main idea of the,) main idea of the lesson, you need to review (four con...,) four prerequisite concepts. The first (idea, I mean, uh,) concept, you need to review is positive integers. A positive (number) integer is any whole (integer, uh,) number greater than zero.

No Vagueness Terms, Extra Content, (Mazes):

This mathematics lesson (will enab...,) will get you to understand (number, uh,) number patterns and about sequences and numerical progressions. Before we get to the (main idea of the,) main idea of the lesson, you need to review (four

con..,) four prerequisite concepts. The first (idea, I mean, uh,) concept you need to review is positive integers, which are not to be confused with integral equations. A positive (number) integer is any whole, (integer, uh,) number greater than zero.

[Vagueness Terms], No Extra Content, No Mazes:

This mathematics lesson [might] get you to understand a [little more] about [some things] we [usually] call number patterns. [Maybe] before we get to [probably] the main idea of the lesson, you [should] review a [few] prerequisite concepts. [Actually,] the first concept you need to review is positive integers. [As you know,] a positive integer is any whole number greater than zero.

[Vagueness Terms], Extra Content, No Mazes:

This mathematics lesson [might] get you to understand a [little more] about [some things] we [usually] call number patterns and about sequences and numerical progression. [Maybe] before we get to [probably] the main idea of the lesson, you [should] review a [few] prerequisite concepts. [Actually,] the first concept you need to review is positive integers which are not to be confused with integral equations. [As you know,] a positive integer is any whole number greater than zero.

[Vagueness Terms], No Extra Content, (Mazes):

This mathematics lesson ([might] enab...,) will get you to understand a [little more] about (number, uh,) [some things]

we [usually] call number patterns. [Maybe] before we get to [probably] the (main idea of the,) main idea of the lesson, you [should] review (a [few] conc...,) four prerequisite concepts. [Actually,] the first (idea, I mean, uh,) concept you need to review is positive integers. [As you know,] a positive (number,) integer is any whole (integer, uh,) number greater than zero.

[Vagueness Terms], Extra Content, (Mazes):

This mathematics lesson ([might] enab...,) will get you to understand a [little more] about (number, uh,) [some things] we [usually] call number patterns and about sequences and numerical progressions. [Maybe] before we get to [probably] the (main idea of the,) main idea of the lesson, you [should] review (a [few] con...,) four prerequisite concepts. [Actually,] the first (idea, I mean, uh,) concept you need to review is positive integers which are not to be confused with integral equations. [As you know,] a positive (number,) is any whole (integer, uh,) number greater than zero.

Subjects (N = 160) from introductory education and psychology classes at a midwest state college were randomly placed into treatment groups. Approximately 55 percent of the subjects were female and over 80 percent were of Caucasian ancestry. Subjects were told they would view a mathematics lesson, that they were to take notes, and then would be tested over the lesson. The subjects viewed the 20 minute videotape lessons and immediately thereafter completed a 17 item criterion-referenced test based on the lesson. The internal reliability of the test measured by the Kuder-Richardson formula was .97.

Results-Study 3

The mean and standard deviation of the achievement scores for the eight treatment conditions are presented in Table 1. A 2 x 2 x 2 analysis of variance was performed on these scores, the results of which are shown in Table 2. A significant main effect ($p < .02$) for the mazes condition was found. Students who viewed the lessons with no mazes earned higher achievement scores ($\bar{X} = 7.08$) than did students who viewed the maze-present lessons ($\bar{X} = 5.75$). The main effect for vagueness terms approached the .05 level of statistical significance ($p < .07$). Students who viewed the lessons with no vagueness terms obtained higher achievement scores ($\bar{X} = 6.95$) than did students who viewed the lesson containing vagueness terms ($\bar{X} = 5.88$). Neither the main effect attributable to additional content nor any of the interaction effects was statistically significant.

TABLE 1

Mean Score of Each Treatment Group[1]

		Mazes			
		Absent		Present	
		Additional Content		Additional Content	
		Absent	Present	Absent	Present
Vagueness Terms	Absent	$\bar{X} = 8.10$ SD = 3.45	$\bar{X} = 7.65$ SD = 4.25	$\bar{X} = 5.80$ SD = 2.97	$\bar{X} = 6.25$ SD = 4.23
	Present	$\bar{X} = 6.15$ SD = 2.68	$\bar{X} = 6.40$ SD = 3.73	$\bar{X} = 5.25$ SD = 3.63	$\bar{X} = 5.70$ SD = 3.08

[1] N = 20 in each treatment group.

TABLE 2

Analysis of Variance on Achievement Test Scores

Source	df	MS	F
Vagueness (A)	1	46.255	3.685*
Mazes (B)	1	70.225	5.599**
Extra Content (C)	1	1.225	<1
A x B	1	11.025	<1
A x C	1	1.225	<1
B x C	1	3.025	<1
A x B x C	1	1.225	<1
Error	152	12.543	

*$p < .07$
**$p < .02$

Discussion

The results of these three studies indicate a cause-effect relationship between teacher lack of clarity (use of vagueness terms and mazes) and student achievement. The effects in absolute terms, however, were small.

No evidence was found to support the hypothesis of a cause-effect relationship between additional, unexplained content and achievement. The students in the third study may have had a cursory prior knowledge of some of the "additional" content. Rather than interfering with learning, the terminology may have assisted learning as indicated by the fact that three of the four groups with the additional content (see Table 1) learned more of the basic content than students without the additional content.

These studies have demonstrated that teacher vagueness terms and mazes do affect pupil achievement. Whether or not the results would be the same over an extended period of teaching in the classroom has not yet been demonstrated. One might speculate that students accommodate teacher vagueness or mazes over a long

period of time. However, it is reasonable to assume the results would be similar to the studies reported here because descriptive research has shown a significant negative correlation between occurrence of vagueness terms and student achievement. In those studies reviewed earlier in this paper, the teachers had used vagueness terms over a fairly long period of time.

The most important recommendation for teacher education arising from the present findings is that teacher trainees should focus on manageable skills that can be observed, quantified, and objectively critiqued by supervisors. In the area of teacher clarity, this would involve assisting trainees in reducing their use of vagueness terms and mazes while engaged in classroom instruction.

Additional related research needed in this area includes the identification of other low inference indicators of clarity, determination of the threshold levels at which these indicators--separately or in combination--affect learning, and the relationship between teacher clarity and other teacher process variables.

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